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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	DETTMER	Examiner:	Saint Surin, J.
Serial No.:	08/699,844	Group Art Unit:	2747
Filed:	August 20, 1996	Docket No.:	AMDA.121US01
Title:	MICROPROCESSOR-CONTROLLED FULL-DUPLEX SPEAKERPHONE USING AUTOMATIC GAIN CONTROL		

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APPEAL BRIEF

Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

This is an Appeal Brief submitted pursuant to 37 CFR section 1.192 for the above-referenced patent application and is being filed in triplicate. A one-month extension of time has also been included with this brief.

I. Real Party in Interest

The real party in interest is Advanced Micro Devices, Inc. (AMD), of Sunnyvale, CA. The above-referenced patent application is assigned to AMD.

II. Related Appeals and Interferences

There are no related appeals or interferences.

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III. Status of Claims

Claims 1, 2, 4, 7-9 and 20-37 remain for consideration. Claims 3, 5, 6 and 10-19 have been canceled.

IV. Status of Amendments

A preliminary amendment was filed on May 13, 1997, prior to the first Office Action, and the first Office Action dated November 18, 1997, indicated entry of the preliminary amendment.

In response to the first Office Action, a first amendment was filed on March 18, 1998, and in response to the second Office Action dated June 26, 1998, a second amendment was filed on September 25, 1998. The second Office Action indicated entry of the first amendment.

An amendment after final rejection was filed on March 26, 1999 in response to the Final Office Action dated December 29,1998. The Final Office Action indicated entry of the second amendment, and an Advisory Action dated April 27, 1999,indicated that the amendment after-final was not be entered.

The claims as finally amended are attached hereto as an Appendix.

V. Summary of Invention

Appellant's invention is a full duplex portable handset speakerphone and a method of operating the duplex speakerphone by a microprocessor in a portable handset. The speakerphone includes a microprocessor (38 of Fig. 1, page 4, line 13), a hands-free receive register coupled to the microprocessor (34 of Fig. 1, page 4, line 11), a hands-free transmit register coupled to the microprocessor (36 of Fig. 1, page 4, line 12), a memory circuit having an algorithm executable by the microprocessor for operating the speakerphone (38 of Fig. 1, page 4, line 13-14), a first analog-to-digital converter coupled to the hands-free receive register (32 of Fig.1, page 4, line 10), a second analog-to-digital converter coupled to the hands-free transmit register (32of Fig, 1, line 10), a first programmable digital attenuator in a speech path and coupled to the microprocessor and to a speaker (52 of Fig.1, page 4, line 18), and a second programmable digital attenuator

in another speech path and coupled to the microprocessor and to a microphone (54 of Fig. 1, page 4, line 18), wherein the microprocessor determines peak volume levels in both speech paths and adjust gain levels in the speech paths in response to the peak volume levels (page 4, lines 24-27).

Appellant's duplex speakerphone invention in another embodiment includes the feature of achieving duplex communication without digital processing by having the microprocessor determine the peak volume levels in both speech paths and adjust the programmable digital attenuators in response to the peak volume levels (No. 38 of Fig. 1, page 4, lines 13-19; 24-27). The method of operating a duplex speakerphone by microprocessor in a portable handset, without digital signal processing, includes the steps of directing the reading of the hands-free registers, and determining the peak volume levels of both speech paths (No.16 of Fig. 1, page 4, lines 24-25); and digitally adjusting the microphone and speaker gains in relation to the peak volume levels (16 of Fig. 1, page 4, lines 25-26; Fig 2, page 5, lines 24-28).

VI. Issues for Review

A. §112 Rejection, Second Paragraph

Are claims 2, 27, 28, 32 and 37 indefinite for failing to point out distinctly claim that which the Appellant regards as his invention? With respect to claim 2, the limitation of " a near full duplex portable handset speakerphone" is not understood and cannot establish the differences between a full duplex portable handset and a near full duplex portable handset". With respect to claims 27, 28, 32 and 37, the word "in" is being inserted to clarify the invention.

B. §103 Rejections

1. With respect to claim 1, does GB 2174578A to *Odhams* ("*Odhams*") in view of U.S. Patent No. 5,768,364 to *Karnowski et al.* ("*Karnowski*") teach or suggest a duplex portable handset speakerphone having a memory circuit having an algorithm executable by a microprocessor, wherein the microprocessor determines peak volume levels in both speech paths and

adjusts gain levels in the speech paths in response to the peak volume levels?

2. With respect to claims 2 and 4, do the cited references in combination fail to teach or suggest a speakerphone system, with a base station, having a full duplex portable handset having microprocessor and a pre-amplifier coupled to the microprocessor and to a second programmable digital attenuator, wherein the microprocessor determines peak volume levels in both speech paths and adjusts gain levels in the speech paths in response to the peak volume levels, without digital signal processing?

3. With respect to claims 7 and 8, do the cited references in combination teach or suggest a method of operating a duplex speakerphone that includes directing the reading of the hands-free registers, determining the peak volume levels of both speech paths and digitally adjusting microphone and speaker gains in relation to the peak volume levels, wherein the stored operation algorithm uses software timers and peak detection?

4. With respect to claim 9, do the cited references in combination teach or suggest the method of operating a duplex speakerphone, according to claim 7, wherein a software timer generates a hardware interrupt to the microprocessor on every speech frame so that one of the hands-free registers can be read by a software peak detector?

5. With respect to claims 20 and 22, do the cited references in combination teach or suggest a method for controlling an audio signal level in a portable device wherein a memory device connected to a microprocessor includes a control algorithm stored therein which contains noise threshold information associated with the audio information signal and controls the microprocessor in accomplishing the steps of monitoring and adjusting the audio signal information and comparing a peak signal level to the stored noise threshold information?

6. With respect to claims 21 and 23, do any of the cited references in combination teach or suggest the method of claim 20 wherein the step of

monitoring is accomplished by providing an audio register having information on the peak signal level of the audio information signal and the amplitude of the audio information signal is adjusted by a programmable attenuator controlled by the microprocessor.

7. With respect to claims 24-26, do any of the cited references in combination teach or suggest a speakerphone arrangement having a logic decision circuit, in the form of a microprocessor circuit, coupled to and controlling digital level adjusters that control the gains of a first and a second speech paths in response to the peak amplitudes of the speech paths, the logic circuit dynamically regulating the balance of the speech paths during full duplex communications?

8. With respect to claims 27, 31 and 34, do any of the cited references in combination teach or suggest a speakerphone arrangement according to claim 24, wherein the logic circuit is further adapted to implement automatic gain control, to regulate gain proportions along at least one of the two speech paths in a full duplex state, and is adapted to operate in a plurality of substates?

9. With respect to claims 28-30, do any of the cited references in combination teach or suggest a speakerphone arrangement according to claim 24, wherein the logic circuit is further adapted to operate in a plurality of full duplex substates, each substate defining a different relationship between respective gains of the first and second speech paths?

10. With respect to claims 32 and 33, do any of the cited references in combination teach or suggest a speakerphone arrangement according to claim 24, wherein the logic decision circuit is further adapted to implement automatic gain control, using hysteresis to regulate gain proportions along both speech paths in a full duplex state, and is adapted to operate in a plurality of full duplex states?

11. With respect to claims 35-37, do the cited references in combination teach or suggest a speakerphone arrangement, and a method of controlling an audio signal, that includes a microphone and a speaker as well as a first

speech path to the speaker, a second speech path to the microphone, a first level-adjustment means adapted to be controlled to adjust the volume along the first speech path, a second level-adjustment means adapted to be controlled to adjust the volume along the second speech path and means for determining regularly the respective peak amplitudes of signals in the first an second speech paths, and in response controlling the gains of the respective first and second speech paths during full duplex operation by controlling the first and second level-adjustment means?

VII. Grouping of Claims

Claims are grouped as follows (11 groups in all): 1; 2 & 4; 7 & 8; 9; 20 & 22; 21 & 23; 24-26; 27, 31 & 34; 28-30; 32 & 33; and 35-37. The claims were originally rejected under §103 as being unpatentable over *Odhams* in view of *Karnowski*. The claims as now presented do not stand or fall together.

VIII. Argument

1. §112 Rejection

Claim 2 was rejected as being indefinite for failing to point out and distinctly claim that which the Appellant regards as his invention.

Does the limitation of "near full duplex portable handset speakerphone" render the claim as indefinite since the Examiner cannot establish the differences between a full duplex portable handset and a near full duplex portable handset"?

In a good faith effort to reduce the number of issues for appeal, Appellant attempted to clarify and correct the language of this claim in their amendment after final filed on March 26, 1999. Appellant proposed deleting the term "near" before the word "full" to clarify the invention, the amendment was not entered by the Examiner as per his Advisory Action of April 27, 1999. Appellant respectfully requests the Board to

enter the claim corrections, which help to clarify the invention, in order to reduce the issues on appeal and allow substantive discussion on the merits of Appellant's claimed invention. Further, the word "in" was inserted in the same amendment to clarify the invention with respect to claims 27, 28, 32 and 37 and does not add new matter to the discussion at hand. A simple reading of the claim will show that an error of syntax was committed in omitting this term. Appellant respectfully requests the Board to enter the amendment after final for purposes of clarifying the claims at issue.

2. §103 Rejection

Each of appealed claims 1-2, 4, 7-9 and 20-37 were rejected as being unpatentable over *Odhams* in view of *Karnowski*, and there were no other rejections to these claims.

Does the combination of *Odhams* and *Karnowski* teach or suggest a duplex portable handset speakerphone having a memory circuit having an algorithm executable by a microprocessor, wherein the microprocessor determines peak volume levels in two speech paths and adjusts gain levels in the speech paths in response to the peak volume levels?

The present invention generally refers to a duplex portable handset speakerphone that is capable of achieving full duplex communication without digital signal processing. The microprocessor in the speakerphone determines peak volume levels in both speech paths and adjusts gain levels in the speech paths in response to the peak volume levels, as set forth in the claims.

Claim 1, for example sets forth this limitation as follows:

> wherein the microprocessor determines peak volume levels in both speech paths and adjusts gain levels in the speech paths in response to the peak volume levels. (lines 14-16).

The claimed invention is patentable over the combination of *Odhams* and *Karnowski* because the combination neither teaches nor suggests the use of a microprocessor that determines peak volume levels in both speech paths and adjusts gain levels in the speech paths in response to the peak volume levels. *Odhams* includes a

duplex portable handset speakerphone that includes a microprocessor, which does not specifically determine peak volume levels in both speech paths, as recognized by the Examiner. The Examiner relies on *Karnowski's h*alf-duplex apparatus that involves monitoring and adjusting only one of the audio signals (TX or RX) at a time through a switch mechanism. The portions of *Karnowski* cited in the office Action confirm that only one of the audio signals (TX or RX) is monitored and its attenuation adjusted. See Col. 7, lines 28-51. *Karnowski* discusses briefly level (peak) detection, but not the use of the microprocessor to determine peak volume levels ... and to adjust gain levels in response to the peak volume levels (emphasis added), as claimed by Appellant. Thus there is no reason to combine such aspects of *Karnowski's* half-duplex apparatus with Odhams' device due to this substantial lack of teaching in either *Odhams* or *Karnowski.* Even if such a combination were made the presently claimed invention, with the basic claim limitations, would not be realized and there would be no reasonable expectation of success.

In the Amendment After Final, Appellant asserted that the Examiner had failed to establish a prima facie case of obviousness because: 1) the asserted combination failed to define an apparatus that includes elements corresponding to all limitations of the claims; 2) that the asserted combination lacked motivation; and 3) no basis for making the combination had been stated or otherwise provided. In the Advisory Action dated April 27, 1999, the Examiner disagreed with the Appellant's argument stating that it was not necessary that the references actually suggest, expressly or in so many words, the changes or improvements that Appellant has made. The test for combining references is what as a whole would have suggested to one of ordinary skill in the art. If this is the case, then the Examiner is required to present a convincing line of reasoning as to why the artisan would have found the claimed invention to have been obvious in light of the teachings of the 2 cited references. MPEP § 2142 (pg. 2100-109).

In attempting to make his prima facie case for obviousness, the Examiner fails to explain why it would be desirable for *Odhams* to use the level (peak) detection of *Karnowski* to gauge signal peak volume levels, since its not part of the operation of *Odhams'* circuit, as well as why it would be desirable to measure gain signal levels. The

Examiner suggests that the signal can be measured from an average level, RMS level or peak level and that one skilled in the art would have determined how to measure gain signal levels. The Examiner's line of reasoning ends at peak signal detection (emphasis added), at most peak volume levels are not even discussed in combination with the *Odhams'* circuit, and *Odhams* fails to teach or suggest the use of the resulting measurements to adjust gain levels in the speech paths in response to the peak volume levels in conjunction with (emphasis added) determining peak volume levels in both speech paths, as in Appellant's claimed invention. Appellant's respectfully request clarification of Examiner's motivation to combine the teachings of *Odhams* and *Karnowski* since it is not immediately apparent to Appellant why the combination of the teachings is proper. *Ex Parte Skinner*, 2 USPQ2d 1788; MPEP §2142 (pg. 2100-109). In view of the above distinctions, Appellant respectfully submits that Examiner has not established a prima facie case of obviousness; and furthermore, the claimed duplex portable handset speakerphone is nonobvious over *Odhams* in view of *Karnowski*.

Does the combination of *Odhams* and *Karnowski* teach or suggest a speakerphone system having a full duplex portable handset that includes a microprocessor, a codec and a pre-amplifier coupled to the microprocessor, wherein the microprocessor determines peak volume levels in two speech paths and adjusts gain levels in the speech paths in response to the peak volume levels and duplex communication is achieved without digital signal processing?

Claims 2 and 4, were also rejected on based on the cited references for claim 1 as being obvious under §103. Claim 2 is directed to a speakerphone system having a full duplex portable handset that includes limitations directed to attenuator adjustment in two speech paths and a pre-amplifier and a codec coupled to the microprocessor. Claim 4 includes a base station with the speakerphone arrangement.

Claim 2,

"a full duplex.." (line 2),

"a pre-amplifier coupled to the microprocessor and a codec having..."(lines 5-6),

"wherein the microprocessor determines peak volume levels in both speech paths and adjusts the programmable digital attenuators in response to the peak volume levels and duplex communication is achieved without digital signal processing." (lines 9-12)

The claimed invention is patentable over the combination of *Odhams* and *Karnowski* because the combination neither teaches nor suggests the use, in a full (emphasis added) duplex portable handset, of a microprocessor that determines peak volume levels in both speech paths and adjusts gain levels in the speech paths in response to the peak volume levels through the use of programable digital attenuators. Appellants also rely on the arguments stated earlier for claim 1. Further, the use of a codec and a pre-amplifier coupled to the microprocessor to provide additional programmable gain is also not taught or suggested by the combination.

Does the combination of *Odhams* and *Karnowski* teach or suggest a method of operating duplex speakerphone that includes directing the reading of the hands-free registers and determining the peak volume levels of both speech paths and digitally adjusting the microphone and speaker gains in relation to the peak volume levels, wherein the stored operation algorithm uses software timers and peak detection?

Claims 7 and 8 are directed to a method of operating a duplex speakerphone by a microprocessor in a handset, the handset having a ROM that contains a stored algorithm for directing the microprocessor, transmit/receive registers, a microphone, a speaker, and a first and second speech paths interfacing with a radio frequency interface. The method includes the following limitations:

"directing the reading of the hands-free registers, and determining the peak volume levels of both speech paths; and digitally adjusting the microphone and speaker gains in relation to the peak volume levels." (claim 7, lines 7-10)

"wherein the stored operation algorithm uses software timers and peak detection." (claim 8, lines 1-2)

The claimed invention is patentable over the combination of *Odhams* and *Karnowski* because the combination neither teaches nor suggests a method of operating a duplex speakerphone, without digital signal processing, that has a handset with a ROM containing a stored algorithm that uses software timers and peak volume detection, to read the transmit/receive registers and to determine the peak volume levels of both speech paths and digitally adjust the microphone and the speaker gains in relation to the peak volume levels. These limitation are not found in the cited combination of references and therefore are considered patentable for the reasons given earlier.

Does the combination of *Odhams* and *Karnowski* teach or suggest a method of operating duplex speakerphone, according to claim 8, wherein a software timer generates a hardware interrupt to the microprocessor on every speech frame so that one of the hands-free registers can be read by a software peak detector?

Claim 9 is directed to a method of operating a duplex speakerphone that has a ROM in the handset that contains a stored algorithm that uses a software timer:

"that generates a hardware interrupt to the microprocessor on every speech frame so that one of the hands-free registers can be read by a software peak detector." (lines 1-3)

This limitation is not found in the combination of the cited references, despite general discussions on software and peak level determination, and therefore is considered patentable for these and the reasons given above.

Does the combination of *Odhams* and *Karnowski* teach or suggest a method of controlling an audio signal in a portable communications device wherein a memory device connected to a microprocessor includes a control algorithm stored therein which contains noise threshold information and controls the microprocessor in monitoring and adjusting the audio signal information, comparing a peak signal level to the stored noise threshold information and adjusting the amplitude of the audio information signal?

Claims 20 and 22 are directed to methods of controlling an audio signal in a portable communications device wherein a memory device connected to a microprocessor includes the limitation:

"a control algorithm stored therein which contains noise threshold information and controls the microprocessor in monitoring and adjusting the audio signal information, comparing a peak signal level to the stored noise threshold information and adjusting the amplitude of the audio signal when the amplitude is greater than the noise threshold." (lines 7-13).

Signal comparisons are disclosed within *Odhams*, however it appears that speech input signals that pass through an amplifier are compared to successive reference voltages. No mention is made of the storing noise threshold information and then using it to compare with the adjusted audio signal information. These limitation are not found in the combination of the cited references, despite general discussions on signal comparison operations, and therefore are considered patentable for these and the reasons given above.

Does the combination of *Odhams* and *Karnowski* teach or suggest a method of controlling an audio signal in a portable communications device wherein a memory device connected to a microprocessor includes a control algorithm stored therein which contains noise threshold information and controls the microprocessor in monitoring, via an audio register, and amplitude ajustment of the audio signal is made by a programmable attentuator via microprocessor control?

Claims 21 and 23 are directed to a method of controlling an audio signal in a portable communications device, according to claim 20, wherein the step of monitoring is accomplished by :

"providing an audio register having information on the peak signal level of the audio information signal and the amplitude of the audio information signal is adjusted by a programmable attenuator controlled by the microprocessor." (lines 2-3).

Signal comparisons are disclosed within *Odhams*, however it appears that speech input signals that pass through an amplifier are compared to successive reference voltages. No mention is made of the storing noise threshold information and then using it to compare with the adjusted audio signal information; nor of adjusting the amplitude of the audio information signal via a programmable attenuator controlled by the

microprocessor. These limitations are neither taught or suggested in the combination of the cited references, despite general discussions on signal adjustment and monitoring, and therefore are considered patentable for these and the reasons given above.

Does the combination of *Odhams* and *Karnowski* teach or suggest a speakerphone arrangement having a logic decision circuit coupled to and controlling digital level adjusters that control the gains of a first and a second speech paths in response to the peak amplitudes of the speech paths, the logic circuit dynamically regulating the balance of the speech paths during full duplex communications?

Claims 24-26 are directed to a speakerphone arrangement having a logic decision circuit, in the form of a microprocessor circuit:

"coupled to and controlling digital level adjusters that control the gains of a first and a second speech paths in response to the peak amplitudes of the speech paths, the logic circuit dynamically regulating the balance of the speech paths during full duplex communications" (lines 8-12)

These limitations are neither taught or suggested in the combination of the cited references, despite the Examiner generally alluding to the fact that the microprocessor 160 of *Karnowski* performs these functions but teaching is lacking in the reference, and therefore are considered patentable for these and the reasons given above.

Does the combination of *Odhams* and *Karnowski* teach or suggest a speakerphone arrangement according to claim 24, wherein the logic circuit is further adapted to implement automatic gain control to regulate gain proportions along at least one of the two speech paths in a full duplex state?

Claims 27, 31 and 34 are directed to a speakerphone arrangement according to claim 24, wherein the logic circuit is further:

" adapted to implement automatic gain control and thereby regulate gain proportions along at least one of the two speech paths in a full duplex state." (lines 2-3)

wherein the substates include a balanced gain relationship, first unbalanced gain relationship and a second unbalanced gain relationship, that depend on whether the

speech volume of the first speech path is either less than or greater than the speech volume of the second speech path.(claim 31,lines 1-6)

"wherein the logic decision circuit is further adapted to operate in a plurality of full duplex substates, with the logic decision circuit transitioning between substates in response to: the volume levels in the first and second speech paths, and the current substate" (claim 34, lines 1-4).

The discussion of these substates of balanced and unbalanced gain relationships with respect to speech volume of each path is not taught in the cited combination. The discussion of substates with the logic circuit transitioning between substates with respect to speech volume of each path is not taught in the cited combination. These limitations are neither taught or suggested in the combination of the cited references, despite the Examiner generally alluding to the fact that the microprocessor 160 of *Karnowski* performs these functions but teaching is lacking in the reference, and therefore are considered patentable for these and the reasons given above.

Does the combination of *Odhams* and *Karnowski* teach or suggest a speakerphone arrangement according to claim 24, wherein the logic circuit is further adapted to operate in a plurality of full duplex substates, each substate defining a different relationship between respective gains of the first and second speech paths?

Claims 28-30 are directed to a speakerphone arrangement according to claim 24, wherein the logic circuit is further adapted:

"adapted to implement automatic gain control to regulate gain proportions along both speech paths in a full duplex state." (claim 28, lines1-3)

"to operate in a plurality of full duplex substates, each substate defining a different relationship between respective gains of the first and second paths." (claim 29, lines 2-4).

" to operate in a plurality of full duplex substates, each substate defining a different relationship between respective gains of the first and second speech paths that is dependent on speech volume of each path".(lines2-4).

The discussion of these plurality of substates of unbalanced gain relationships with respect to speech volume of each path is not taught in the cited combination. These

limitations are neither taught nor suggested in the combination of the cited references, and therefore are considered patentable for these and the reasons given above..

Does the combination of *Odhams* and *Karnowski* teach or suggest a speakerphone arrangement according to claim 24, wherein the logic decision circuit is further adapted to implement automatic gain control using hysteresis to regulate gain proportions along both speech paths in a full duplex state?

Claims 32 and 33 are directed to a speakerphone arrangement according to claim 24, wherein the logic decision circuit is further adapted:

" to implement automatic gain control using hysteresis to regulate gain proportions along both speech paths in a full duplex state.(claim 32, lines 2-3)

"to operate in a plurality of full duplex substates, each substate defining a different relationship between respective gains of the first and second speech paths, one of the substates include a balanced gain relationship, another substate including a first unbalanced gain relationship used in response to the speech volume of the first speech paths that is less than the speech volume of the second speech path, and another substate including a second unbalanced gain relationship used in response to the speech volume of the first speech path that is greater than the speech volume of the second speech path. (claim 33, lines 2-9).

The cited references fail to teach the use of hysteresis in a full duplex arrangement even though the hysteresis concept is generally discussed. The discussion of these substates of balanced and unbalanced gain relationships with respect to speech volume of each path is not taught in the cited combination. These limitations as claimed are neither taught nor suggested in the combination of the cited references and are therefore considered patentable for these and the reasons given above for the main independent claims.

Does the combination of *Odhams* and *Karnowski* teach or suggest a speakerphone arrangement that includes means for determining regularly the respective peak amplitudes of signals in a first and second speech paths, and in response controlling the gains of the respective first and second speech paths during full duplex operation by controlling the first and second level-adjustment means?

Claims 35-37 are directed to a speakerphone arrangement and a method of controlling au audio signal in a portable handset, that includes a microphone, a speaker, a first speech path to the speaker, a second speech path to the microphone, a first level-adjustment means adapted to be controlled to adjust the volume along the first speech path, a second level-adjustment means adapted to be controlled to adjust the volume along the second speech path, that includes:

"means for determining regularly the respective peak amplitudes of signals in the first an second speech paths, and in response controlling the gains of the respective first and second speech paths during full duplex operation by controlling the first and second level-adjustment means".(claim 35, lines 8-11)

"determining regularly the respective peak amplitudes of signals in the first and second speech paths; and in response, controlling the gains of the respective first and second speech paths; and using automatic gain control with hysteresis to regulate gain proportions along both speech paths during full duplex operation.." (claim 36, lines 4-7; claim 37, lines 2-3).

The claimed invention is patentable over the combination of *Odhams* and *Karnowski* because the combination neither teaches nor suggests means for determining regularly the respective peak amplitudes of signals in both speech paths and controlling the gainsin the respective speech paths during full duplex operation by controlling the first and second level-adjustment means. The claimed invention is patentable over the combination of *Odhams* and *Karnowski* because the combination neither teaches nor suggests a method of controlling an audio signal by determining regularly the respective peak amplitudes of signals in both speech paths and, in response, controlling the gains in the respective speech paths during full duplex operation. *Karnowski* discusses briefly level (peak) detection, but for the purpose of determining whether the signal is a transmit or receive signal (Col. 7, line11-15; lines 47-49). Thus there is no reason to combine such aspects of Karnowski's half-duplex apparatus with Odhams' device due to this substantial lack of teaching in either Odhams or Karnowski. Even if such a combination were made the presently claimed invention, with the basic claim limitations, would not be realized and there would be no reasonable expectation of success. These limitations are neither taught nor suggested in the combination of the cited references, and therefore are considered patentable for these and the reasons given above.

IX. Conclusion

In view of the above distinctions, Applicants believe the claimed invention to be patentable over the cited references since none of the references cited, either individually or in combination, teach or suggest Applicants' invention. Claims 1, 2, 4, 7-9 and 20-37 remain for consideration. Appellant respectfully requests reversal of the rejection as applied to the appealed claims and allowance of the application.

Please charge Deposit Account No. 01-0365 (TT1220) in the amount of $300.00 for filing a Brief in support of an appeal as set forth in §1.17 (c) as well as for the 1 month extension of time.

Respectfully submitted,

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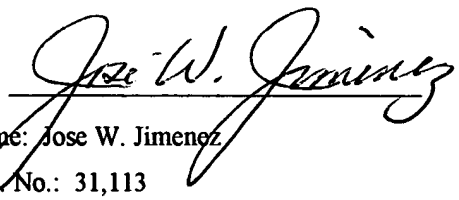
By: 

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APPENDIX OF APPEALED CLAIMS

1. A duplex portable handset speakerphone, comprising:

a microprocessor;

a hands-free receive register coupled to the microprocessor;

a hands-free transmit register coupled to the microprocessor;

a memory circuit having an algorithm executable by the microprocessor for operating the speakerphone;

a first analog-to-digital converter coupled to the hands-free receive register;

a second analog-to-digital converter coupled to the hands-free transmit register;

a first programmable digital attenuator in a speech path and coupled to the microprocessor and to a speaker;

a second programmable digital attenuator in another speech path and coupled to the microprocessor and to a microphone;

wherein the microprocessor determines peak volume levels in both speech paths and adjusts gain levels in the speech paths in response to the peak volume levels.

2. A speakerphone system comprising:

a near full duplex portable handset including

an integrated circuit controller chip having a microprocessor, an embedded hands-free receive register coupled to the microprocessor, an embedded hands-free transmit register coupled to the microprocessor, a pre-amplifier coupled to the microprocessor, and a codec having first and second programmable digital attenuators, the first programmable digital attenuator coupled to the microprocessor, and the second programmable digital attenuator coupled to the microprocessor, to the embedded hands-free transmit register, and to the pre-amplifier; wherein the microprocessor determines peak volume levels in both speech paths and adjusts the programmable digital attenuators in response to the peak volume levels and duplex communication is achieved without digital signal processing.

4. The speakerphone system of claim 2, further including a base station comprising:
an integrated circuit controller chip comprising a codec;
a telephone line interface; and
a radio frequency interface.

7. A method of operating a duplex speakerphone by a microprocessor in a portable handset, without digital signal processing, the handset further including a ROM containing a stored operation algorithm for directing the microprocessor, hands-free transmit and receive registers, a microphone, a speaker, a first-speech path between the microphone and a radio frequency interface, and a second speech path between the speaker and the radio frequency interface, the method comprising the steps of:

a. directing the reading of the hands-free registers, and determining the peak volume levels of both speech paths; and

b. digitally adjusting the microphone and speaker gains in relation to the peak volume levels.

8. The method of claim 7, wherein the stored operation algorithm uses software timers and peak detection.

9. The method of claim 8, wherein a software timer generates a hardware interrupt to the microprocessor on every speech frame so that one of the hands-free registers can be read by a software peak detector.

20. A method of controlling an audio signal level in a portable communications device, comprising the steps of:

a. providing a signal path having an audio information signal;

b. providing a microprocessor connected to said signal path;

c. providing a memory device connected to said microprocessor, wherein said memory device includes a control algorithm stored therein which contains noise threshold information associated with said audio information signal;

d. monitoring said audio information signal to determine a peak signal level for said audio information signal;

e. comparing said peak signal level to said stored noise threshold information;

f. adjusting the amplitude of said audio information signal when said amplitude is greater than said noise threshold information.

21. The method of claim 20, wherein said step of monitoring is accomplished by providing an audio register having information representing said peak signal level of said audio information signal.

22. The method of claim 20, wherein said microprocessor is controlled by said control algorithm to accomplish said steps of monitoring, comparing and adjusting.

23. The method of claim 20, wherein said amplitude of said audio information signal is adjusted by a programmable attenuator which is controlled by said microprocessor.

24. A speakerphone arrangement including a microphone and a speaker, comprising:

a first speech path to the speaker;

a second speech path to the microphone;

a first programmable digital level-adjuster adapted to be controlled to provide a gain adjustment along the first speech path;

a second programmable digital level-adjuster adapted to be controlled to provide a gain adjustment along the second speech path; and

a logic decision circuit, coupled to the first and second programmable digital level-adjustors, adapted to determine regularly the respective peak amplitudes of signals in the first and second speech paths, and, in response, controlling the gains of the respective first and second speech paths during full duplex operation by controlling the first and second programmable digital level-adjusters.

25. A speakerphone arrangement, according to claim 24, wherein the logic decision circuit is a microprocessor circuit.

26. A speakerphone arrangement, according to claim 24, wherein the logic decision circuit is configured and arranged to dynamically regulate the balance of the speech paths during full duplex communication.

27. A speakerphone arrangement, according to claim 24, wherein the logic decision circuit is further adapted to implement automatic gain control and thereby regulate gain proportions along at least one of the two speech paths a full duplex state.

28. A speakerphone arrangement, according to claim 24, wherein the logic decision circuit is further adapted to implement automatic gain control and thereby regulate gain proportions along both speech paths a full duplex state.

29. A speakerphone arrangement, according to claim 24, wherein the logic decision circuit is further adapted to operate in a plurality of full duplex substates, each substate defining a different relationship between respective gains of the first and second speech paths.

30. A speakerphone arrangement, according to claim 29, wherein the substates include a first unbalanced gain relationship used in response to the speech volume of the first speech path that is less than the speech volume of the second speech path, and a second unbalanced gain relationship used in response to the speech volume of the first speech path that is greater than the speech volume of the second speech path.

31. A speakerphone arrangement, according to claim 29, wherein the substates include a balanced gain relationship, first unbalanced gain relationship used in response to the speech volume of the first speech path that is less than the speech volume of the second speech path, and a second unbalanced gain relationship used in response to the speech volume of the first speech path that is greater than the speech volume of the second speech path.

32. A speakerphone arrangement, according to claim 24, wherein the logic decision circuit is further adapted to implement automatic gain control using hysteresis and thereby regulate gain proportions along both speech paths a full duplex state.

33. A speakerphone arrangement, according to claim 24, wherein the logic decision circuit is further adapted to operate in a plurality of full duplex substates, each substate defining a different relationship between respective gains of the first and second speech paths, one of the substates include a balanced gain relationship, another substate including a first unbalanced gain relationship used in response to the speech volume of the first speech path that is less than the speech volume of the second speech path, and another substate including a second unbalanced gain relationship used in response to the speech volume of the first speech path that is greater than the speech volume of the second speech path.

34. A speakerphone arrangement, according to claim 24, wherein the logic decision circuit is further adapted to operate in a plurality of full duplex substates, with the logic decision circuit transitioning between substates in response to: the volume levels in the first and second speech paths, and the current substate.

35. A speakerphone arrangement including a microphone and a speaker, comprising:

a first speech path to the speaker;

a second speech path to the microphone;

a first level-adjustment means adapted to be controlled to adjust the volume along the first speech path;

a second level-adjustment means adapted to be controlled to adjust the volume along the second speech path;

means for determining regularly the respective peak amplitudes of signals in the first and second speech paths, and in response controlling the gains of the respective first and second speech paths during full duplex operation by controlling the first and second level-adjustment means.

36. A method of controlling an audio signal level in a portable communications device having a first speech path to a speaker and a second speech path to a microphone, comprising:

determining regularly the respective peak amplitudes of signals in the first and second speech paths; and

in response, controlling the gains of the respective first and second speech paths during full duplex operation.

37. A method of controlling an audio signal level in a portable communications device, according to claim 36, further including using automatic gain control with hysteresis and thereby regulating gain proportions along both speech paths a full duplex state.